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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/886,959
Filing Date: June 20, 2001
Appellant(s): AVIZIENIS, ALGIRDAS

Peter L. Lippman
Reg. 22,835
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 24th, 2007 appealing from the Office action mailed August 24th, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

United States Patent 6,176,616

Ex parte Lemoine, Appeal 94-0216

The Examiner points out these related appeals were not provided to the Examiner, and that the issues in these cases may differ greatly. These appeals appear to provide the rationale for much of Applicant's action however.

(3) Status of Claims

The statement of the status of claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal involves claims 1-24, 33-59, 61-71 and 73-83.

Claim 84 is allowed.

Claims 62-64 and 76-78 have been canceled.

This required under MPEP 716.01 c III. A corresponding entry in the Status of Amendments shows the required Examiner's Amendment. The Examiner points out, that is not a discretionary function, but is required under MPEP guidance.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is incorrect.

As required by MPEP due to Applicant's deliberate and repeated attempts to force a partial withdraw, the Examiner has simultaneously issued an Examiner's Amendment After Final Rejection canceling the required claims with this Examiner's Answer

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

Claim 62 is now canceled and therefor its inclusion is extraneous.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

A substantially correct copy of appealed claims appears on page 51 of the Appendix to the appellant's brief. The minor errors are as follows:

Claims 62-64 and 76-78 are canceled.

(8) Evidence Relied Upon

4,995,040 Best 2-1991

Avižienis (The N-Version Approach to Fault-Tolerant Software, 1985)

Affidavit under 37 CFR 1.132 by Jean-Claude Laprie

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Rejections under 35 USC §112, first paragraph

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 79 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. At not point in the specification is it ever discussed whether the claimed invention is a circuit breaker. This claim is believed to be a result of a conversation with Applicant, and as such was not held by Applicant at the time of the filing of the disclosure.

Rejections under 35 USC §112, second paragraph

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2, 3, 7, 12, 19, 24, 27, 41, 54, 61 and 65-69 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per claims 2, 3, 7, 12, 19, 24, 27, 41, 54, 61 and 65-69, the Examiner is unable to determine the bounds of "substantially exclusively made up of substantially commercial, off-the-shelf components." The Examiner is unable to determine a reasonable limit to the claims. Applicant responses to this rejection previously reaffirm the Examiner's inability to precisely define metes and bounds of the claims. Despite Applicant's extensive arguments, the Examiner feels the claims themselves must be clear.

Rejections under 35 USC §112, fourth paragraph

The following is a quotation of the fourth paragraph of 35 U.S.C. 112:

> Subject to the following paragraph, a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

Claims 4, 16, 36, 47, 59, 66 and 82 are rejected under 35 USC §112, fourth paragraph as they fail to further limit the scope of the claims. The *such computer system* of these claims is each case has already been claimed verbatim in the parent claim. These claims recite a "such computer." Each claim depends from a parent claim containing in the preamble: "failure of a computer system." Each parent claim then recites the failure in the body of the claim. As the failure is recited in the body of the claim, the descriptors from the preamble breath life into the bodily recited limitation and warrant patentable weight. As the Examiner is then required to find the computer system, reciting "such computer system" in its own claim becomes a redundant limitation, and when presented singularly fails to meet the requirements of §112, fourth paragraph, namely that a dependant claim must further limit the parent. Additionally, the preamble of the claims set forth the claiming of the apparatus used with the computer not, the computer system for which it is used.

Rejections under 35 USC §102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4-8, 11, 13-17, 19, 20, 42, 44, 45, 47, 48, 53, 54, 70 and 79 rejected under 35 U.S.C. 102(b) as being anticipated by Best (United Stats Patent No. 4,99,5,040).

Best discloses:

1. Apparatus for deterring failure of a computing system; said apparatus comprising:

a hardware network of components, having substantially no software and substantially no firmware except programs held in an unalterable read-only memory (Figures 3, 4 and 5 disclose a hardware network of fault detection and handling components);

terminals of the network for connection to such system (Figure 4, message channel and associated buffers act as terminals, column 3, lines 8-15);

fabrication-pre-programmed hardware circuits of the network for guarding such system from such failure (column 6, lines 23-27).

4. The apparatus of claim 1, further comprising:

such computing system (column 3, lines 2-7).

5. The apparatus of claim 1, wherein:

the circuits comprise portions for identifying failure of the any of the circuits and correcting for the identified failure (column 6, lines 10-14).

6. The apparatus of claim 1, wherein:

the circuits are not operable of running an application program (column 6, lines 28-45: no application programs are disclosed and the logic elements are simple comparators and voters which the capability to carry out application execution).

7. The apparatus of claim 1, particularly for use with a computing system that is substantially exclusively made of commercial off the shelf components and that has at least one hardware component for generating a response of the system to failure (column 6, lines 10-14 the computer system will generate abnormal/incorrect data and place it onto the bus); and wherein:

the circuits comprise portions for reacting to such response of such hardware subsystem (column 6, lines 10-14).

8. The apparatus of claim 1, particularly for use with a computing system that has plural generally parallel computing channels (column 5, lines 26-59); and wherein:

the circuits comprise portions for comparing computational results from such parallel channels (column 5, lines 26-59).

9. The apparatus of claim 8, wherein:

the parallel channels of such computing system are of diverse design or origin (column 3, lines 5: the channels are attached to different computer systems and thus are generated at a diverse origin).

11. The apparatus of claim 1, wherein:

the circuits comprise modules for collecting and responding to data received from at least one of the terminals (column 5, lines 26-39), said modules comprising:

at least there data collecting and responding modules (column 5, lines 26-39), and

processing sections for conferring among the modules to determine whether any of the modules has failed (column 5, lines 43-59).

79. The apparatus of claim 1, wherein:

the apparatus is not a circuit breaker (Fig 3 does not incorporate a circuit breaker).

13. Apparatus for deterring failure of an entire computing system, wherein the computing system optionally includes plural mutually redundant modules; said apparatus comprising:

a network of components having terminals for connection to such system, wherein the network is constructed to be initially and permanently distinct from such computing system including all of such redundant modules (Figures 3, 4, and 5 show the voting and recovery circuitry being separate from the plural data channels coming off of the redundant processors inherent to the computer not shown);

circuit of the network for operating programs to guard such entire systems from failure (column 6, lines 23-27);

the circuits comprising portions for identifying failure of any of the circuits and correcting for the identified such failure (column 6, lines 2).

14. The apparatus of claim 13, wherein:

the program-operating portions comprise a section that corrects for the identified such failure by automatically taking a failed circuit out of operation (column 6, lines 10-14).

15. The apparatus of claim 13, wherein:

the network is an infrastructure that continuously waits to respond to messages from such system (columns 3 and 4 show an apparatus which uses comparators to check messages continuously).

16. The apparatus of claim 16, further comprising:

such computing system (column 4, lines 1-25).

20. The apparatus of claim 13, particularly for use with a computing system that has plural generally parallel computing channels (column 5, lines 26-59); and wherein:

the circuits comprise portions for comparing computational results from such parallel channels (column 5, lines 26-59).

17. The apparatus of claim 13, wherein:

the program-operating portions comprise at least three of the circuits (column 3-14 and Figure 4); and

such failure is identified at least in part by majority vote among the at least three circuits (column 5, lines 43-51).

19. The apparatus of claim 13, particularly for use with a computing system that is substantially exclusively made of commercial, off-the-shelf components and that has at least one hardware subsystem for generating a response of the system to failure (column 6, lines 10-14); and wherein:

the circuits comprise portions for reacting to such response of such hardware subsystems (column 6, lines 10-14).

20. The apparatus of claim 13, particularly for use with a computing system that has plural generally computing channels (column 5, lines 26-35); and wherein:

the circuits comprise portions for comparing computational results from such parallel channels (column 5, lines 43-51).

70. The apparatus of claim 13, wherein:

the circuits do not and cannot operate any application program; and are not controlled by any associated host computer that is capable of running any application program (Best does not disclose any host computer programs as avoided by the claims) (column 6, lines 28-45: no application programs are disclosed and the logic elements are simple comparators and voters which the capability to carry out application execution).

42. Apparatus for deterring failure of an entire computing system that is distinct from the apparatus and that has plural generally parallel computing channels and has at least one application input module and at least one processor for running an application program; said apparatus comprising:

a network of components having terminals for connection to such system (Figures 3, 4 and 5); and

circuits of the network for operating programs to guard such entire system from such failure wherein the network is constructed to be initially and permanently distinct from such computing system (Figures 3, 4 and 5 show a clear delineation between the plural processing channels of the computer system which feed into message buffers and fault detecting and handling system which protects it) (a) every such application-

data input module (the protection buffers receive the data from these elements and thus can not be them) and (b) every such application-program processor (the computer disclosed as running the applications are not part of the protection system, but are at the other end of a bus), and (c) all of such parallel computing channels (Figures3-5 clearly show the computer channels feeding into a separate buffering system separates the protection system from the computer system);

the circuits comprising portions for comparing computational results from such parallel channels (column 5, lines 26-29).

47. The apparatus of claim 42, further comprising:

such computer system (column 4, lines 1-13).

44. The apparatus of claim 42, wherein:

the comparing portions comprise at least one section for analyzing discrepancies between the results from such parallel channels (column 5, lines 26-59).

48. The apparatus of claim 42, wherein:

the circuits do not and cannot operate any application program (column 6, lines 28-45: no application programs are disclosed and the logic elements are simple comparators and voters which the capability to carry out application execution); and are not controlled by any associated host computer that is capable of running any application program (Best does not disclose this type of host or control)

53. The apparatus of claim 42, wherein:

the circuits comprise modules for collecting and responding to data received from at least one of the terminals (column 5, lines 26-39), said modules comprising:

at least three data-collecting and responding modules (column 5, lines 26-39), and

processing sections for conferring among the modules to determine whether any of the modules has failed (column 5, lines 43-59).

Rejection under 35 USC §103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 3, 9, 10, 12, 18, 21-24, 33-38, 41, 43, 46, 49, 50, 51, 52, 55-61, 65-69, 71-75 and 80-83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Best (United States Patent No. 4,995,040) in view of Avižienis (*The N-Version Approach to Fault-Tolerant Software*, 1985, it is further acknowledged, that Dr. Avižienis is the current named inventor of the present application).

2. Best does not disclose, while Avižienis teaches:

at least one of the network terminals is connected to receive one error signal generated by such system in event of incipient such failure of such a system (page 1498 describes how the Decision and Executive layer receives exceptions from the version layer indicating errors within the instance running that particular version of the software);

at least one of the network terminals is connected to provide one recovery signal to such system upon receipt of the error signal (page 1498 describe the use of the local executive processing faults and providing and solution to the problem); and

the apparatus further comprises means for automatically responding to the at least one error signal by generating the at least one recovery signal for guarding all such system against failure (page 1498 discloses the local and global executives at differing levels providing commands to the version which prevent failure).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496,

column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

3. Best does not disclose, while Avižienis teaches:

the network is an interface which is generic in that it can accommodate any such system that can issue an error message and handle recovery command (page 1498: DEDIX hides all the fault processing from the version layer, and it is the decision and executive layer which performs this functionality, making it generic).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single

computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

9. Best discloses:

the parallel channels of such computing system are diverse. (column 3, lines 5: the channels are attached to different computer systems and thus are generated at a diverse origin).

Best does not disclose, while Avižienis teaches:

the parallel channels of such computing system are of diverse design or manfacture. (Avižienis discloses on p1500 a discussion of the extensibility of the N-

Version system to the design of inte3rgrated circuitry from the discloses the software methodology).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

10. Best does not disclose, while Avižienis teaches:

particularly for use with a computer system that has plural processors (Best does disclose use with "dissimilar computing elements for performing computing operations" but not specifically processors; Avižienis does disclose processor indirectly by monitoring for processor errors on page 1498: "dependent on a specific computer system...implementation technique"); and wherein:

the circuits comprise portions for identifying failure of any such processors and correcting for identified failure (page 1498 discloses how Avižienis handles processor faults, while Best simply handles any fault coming down the communication channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes,

and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

12. Best does not disclose, while Avižienis teaches:

particularly for use with a computing system that is substantially exclusively made of commercial, off-the-self components and that has at least one subsystem for generating a response to failure (page 1498 describes the Version layer reporting errors and receiving decisions results).

the circuits comprise portions for interposing analysis and a corrective action between such response-generating subsystem and such command receiving subsystem (page 1498 describes the Version layer reporting errors and receiving decisions results and those result come from the decision and executive layer; Best further describes interposing circuitry for detection and correction at column 5, lines 43-51).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3,

lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

80. Best does not disclose, while Avižienis teaches:

at least one of the network terminals is connected to receive at least one error signal generated by such system in event of incipient such failure (page 1498 discloses

specific application and OS error messages handled by the Local executive, Best discloses detecting the failures itself from the data on the channel);

at least one of the network terminals is connected to provide at least one recovery signal to such system upon receipt of the error signal (page 1498 discloses specific application and OS error recovery commands handled by the Local executive, while Best discloses substituting the correct data onto the channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of

avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

18. Best does not disclose, while Avižienis teaches:

to guard such entire system from failure (column 3, lines 56-64 and column 6, lines 28-47) said circuits receive from such system error messages warning of incipient failure, and issue recovery commands to such system (page 1498 discloses specific application and OS error recovery commands handled by the Local executive, while Best discloses substituting the correct data onto the channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has

expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

21. The apparatus of claim 16, wherein:

the computer system has such parallel channels that are diverse (column 3, lines 5: the channels are attached to different computer systems and thus are generated at a diverse origin).

Best does not disclose, while Avižienis teaches:

the parallel channels of such computing system are of diverse design (Avižienis discloses on p1500 a discussion of the extensibility of the N-Version system to the design of inte3rgrated circuitry from the discloses the software methodology).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable

at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

22. Best does not disclose, while Avižienis teaches:

particularly for use with a computing system that has plural processors (Best does disclose use with "dissimilar computing elements for performing computing operations" but not specifically processors; Avižienis does disclose processor indirectly

by monitoring for processor errors on page 1498: "dependent on a specific computer system...implementation technique"); and wherein:

the circuits comprise portions for identifying failure of any such processors, based on error message from such system (Best: column 4, lines 60-65) and correcting for identified such failure (page 1498 discloses how Avižienis handles processor faults, while Best simply handles any fault coming down the communication channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of

avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

23. Best does not disclose, while Avižienis teaches:

the network is an infrastructure which is generic in that it can accommodate any such system that can issue an error message and handle recovery command (page 1498: DEDIX hides all the fault processing from the version layer, and it is the decision and executive layer which performs this functionality, making it generic).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes,

and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

24. Best does not disclose, while Avižienis teaches:

particularly for use with a computing system that is substantially exclusively made of commercial, off-the-self components and that has at least one subsystem for generating a response to failure , and that also has at least one subsystem for receiving recovery commands (page 1498 describes the Version layer reporting errors and receiving decisions results).

the circuits comprise portions for interposing analysis and a corrective action between the response-generating subsystem and the command receiving subsystem (page 1498 describes the Version layer reporting errors and receiving decisions results and those result come from the decision and executive layer; Best further describes interposing circuitry for detection and correction at column 5, lines 43-51).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3,

lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

33. Best discloses:

Apparatus for deterring failure of a computing system:

a network of components having terminals for connection to such system (Figure 3-5); and

circuits of the network for operating programs to guard such system from failure (column 6, lines 23-27).

Best does not explicitly disclose, while Avižienis teaches:

Apparatus that is substantially exclusively made of commercial, off-the-shelf components and that has at least one hardware subsystem for generating an error message of the system about incipient failure (page 1498 describes the Version layer reporting errors and receiving decisions results),

the portions for reacting to such error message of such hardware system (1498 discloses the Local and global executives performing these functions).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496,

column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

34. Best discloses:

in response to such error message (column 4, lines 60-64), the circuits guard the entire such system from failure (column 3, lines 21-27).

35. Best does not disclose, while Avižienis teaches:

the network is an interface which is generic in that it can accommodate any such system that can issue an error message and handle recovery command (page 1498: DEDIX hides all the fault processing from the version layer, and it is the decision and executive layer which performs this functionality, making it generic).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3,

lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

36. Best in combination with Avižienis teaches:

such computing system, including such hardware system. (column 3, lines 21-29).

37. Best discloses:

the computing system has plural generally parallel computing channels (column 5, lines 26-59); and

such parallel channels of such computing system are diverse. (column 3, lines 5: the channels are attached to different computer systems and thus are generated at a diverse origin).

Best does not disclose, while Avižienis teaches:

the parallel channels of such computing system are of diverse design or manfacture. (Avižienis discloses on p1500 a discussion of the extensibility of the N-Version system to the design of inte3rgrated circuitry from the discloses the software methodology).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496,

column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

38. Best discloses:

said circuits are not operable of running an application program (column 6, lines 28-45: no application programs are disclosed and the logic elements are simple comparators and voters which the capability to carry out application execution).; and are not controlled by any associated host computer that is capable of running an application program (Best discloses none of this).

41. Best does not explicitly disclose, while Avižienis teaches:

particularly for use with a computing system that is substantially exclusively made of commercial, off-the-self components and that has at least one subsystem for

generating a response to failure , and that also has at least one subsystem for receiving recovery commands (page 1498 describes the Version layer reporting errors and receiving decisions results).

the circuits comprise portions for interposing analysis and a corrective action between the response-generating subsystem and the command receiving subsystem (page 1498 describes the Version layer reporting errors and receiving decisions results and those result come from the decision and executive layer; Best further describes interposing circuitry for detection and correction at column 5, lines 43-51).

43. The apparatus of claim 47, wherein:

the computer system has parallel channels that are diverse (column 3, lines 5: the channels are attached to different computer systems and thus are generated at a diverse origin).

Best does not disclose, while Avižienis teaches:

the parallel channels of such computing system are of diverse design (Avižienis discloses on p1500 a discussion of the extensibility of the N-Version system to the design of inte3rgrated circuitry from the discloses the software methodology).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed

data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

46. Best does not explicitly disclose, while Avižienis teaches:

the network is an infrastructure which is generic in that it can accommodate any such system that can issue an error message and handle recovery command (page 1498: DEDIX hides all the fault processing from the version layer, and it is the decision and executive layer which performs this functionality, making it generic).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the

time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

49. Best does not disclose, while Avižienis teaches:

to guard such entire system from such failure (Best: column 2, lines 56-63 and column 6, lines 28-47) said circuits receive from such computing system error messages warning of incipient such failure, and issue recovery commands to such system (page 1498 discloses specific application and OS error recovery commands handled by the Local executive, while Best discloses substituting the correct data onto the channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has

expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault.locating and handling system of Best, thereby creating a stronger N-Version software system.

52. Best does not disclose, while Avižienis teaches:

particularly for use with a computing system that has plural processors (Best does disclose use with "dissimilar computing elements for performing computing operations" but not specifically processors; Avižienis does disclose processor indirectly by monitoring for processor errors on page 1498: "dependent on a specific computer system...implementation technique"); and wherein:

the circuits comprise portions for identifying such failure of any such processors and correcting for identified such failure (page 1498 discloses how Avižienis handles processor faults, while Best simply handles any fault coming down the communication channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3,

lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

54. Best does not disclose, while Avižienis teaches:

particularly for use with a computing system that is substantially exclusively made of commercial, off-the-self components and that has at least one subsystem for

generating a response to failure (page 1498 describes the Version layer reporting errors and receiving decisions results).

the circuits comprise portions for interposing analysis and a corrective action between the response-generating subsystem and the command receiving subsystem (page 1498 describes the Version layer reporting errors and receiving decisions results and those result come from the decision and executive layer; Best further describes interposing circuitry for detection and correction at column 5, lines 43-51).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis

produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

50. Best discloses:

Apparatus for deterring failure of an entire computing system that is distinct from the apparatus and that has plural generally parallel computing channels (column 2, lines 56-69 and column 6, lines 28-47); said apparatus comprising:

a network of components having terminals for connection to such system (Figures 3-5); and

circuits of the network for operating programs to guard such entire system from such failure, wherein such network is constructed to initially distinct from such computing system including all of such plural computing channels (Figures 3-5);

the circuits comprising portions for comparing computational results from such parallel channels (Figures 3-5).

Avižienis teaches:

the comparing means portions comprise circuitry for performing an algorithm to validate a match that is inexact (page 1498); and

the algorithm-performing circuitry employs a degree of inexactness suited to a type of computation under comparison (page 1498).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of

Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

51. Best in combination with Avižienis discloses:

the algorithm-performing circuitry performs an algorithm that selects a degree of inexactness based on the type of computation under comparison (page 1498); and

the circuits also impose corrective action upon such system based upon discrepancies found by the comparing portion (column 6, lines 10-14).

71. Best discloses:

the circuits do not and cannot operate any application program (column 6, lines 28-45: no application programs are disclosed and the logic elements are simple comparators and voters which the capability to carry out application execution).

72. Best discloses:

the circuits protect the entire such system (column 3, lines 21-27).

73. Best does not disclose, while Avižienis teaches:

to guard such entire system from failure (column 2, lines 56-64 and column 6, lines 28-67) said circuits receive from such system error messages warning of incipient failure, and issue recovery commands to such system (page 1498 discloses specific

application and OS error recovery commands handled by the Local executive, while Best discloses substituting the correct data onto the channel).

74. Best does not disclose, while Avižienis teaches:

the network is an infrastructure which is generic in that it can accommodate any such system that can issue an error message and handle recovery command (page 1498: DEDIX hides all the fault processing from the version layer, and it is the decision and executive layer which performs this functionality, making it generic).

55. Best discloses:

Apparatus for deterring failure of any computer system, said apparatus comprising:

a network of components having terminals for connection to such system, wherein the network is constructed to be initially and permanently distinct from such computing system including all of such redundant modules (Figures 3, 4, and 5 show the voting and recovery circuitry being separate from the plural data channels coming off of the redundant processors inherent to the computer not shown);

circuit of the network for operating programs to guard such entire systems from such failure (column 6, lines 23-27);

the circuits comprising portions for identifying such failure of any of the circuits and correcting for the identified such failure (column 6, lines 2).

Best does not disclose while, Avižienis teaches:

system that has plural processors (Best does disclose use with "dissimilar computing elements for performing computing operations" but not specifically processors; Avižienis does disclose processor indirectly by monitoring for processor errors on page 1498: "dependent on a specific computer system...implementation technique") and is capable of generating error messages warning of incipient failure, and capable of responding to recovery command (page 1498 discloses specific application and OS error recovery commands handled by the Local executive, while Best discloses substituting the correct data onto the channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes,

and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

75. Best discloses:

the program-operating circuits guard any such system from failure by issuing a recovery command (column 6, lines 10-14).

Avižienis discloses:

the failure-identifying and correcting portion provide the recovery command (page 1498).

56. Avižienis discloses:

the identifying portions comprise a section that corrects for the identified such failure by taking the failed processor out of operations (page 1498).

57. Best discloses:

the circuits cannot and do not run an application program (column 6, lines 28-45: no application programs are disclosed and the logic elements are simple comparators and voters which the capability to carry out application execution).

58. Best discloses:

the circuits protect the entire such system (column 3, lines 21-28).

59. Best discloses:

such computing system (Figure 1).

61. Best and Avižienis disclose:

the circuits comprise portions for interposing analysis and a corrective action between the response-generating subsystem and the command receiving subsystem (page 1498 describes the Version layer reporting errors and receiving decisions results and those result come from the decision and executive layer; Best further describes interposing circuitry for detection and correction at column 5, lines 43-51).

Avižienis discloses:

particularly for use with a computing system that is substantially exclusively made of commercial, off-the-self components and that has at least one subsystem for generating a response to failure (page 1498 describes the Version layer reporting errors and receiving decisions results).

64. Best in combination with Avižienis discloses:

particularly for use with a computing system that is substantially exclusively made of commercial, off-the-self components and that has at least one subsystem for generating a response to failure, and that also has at least one subsystem for receiving recovery commands (page 1498 describes the Version layer reporting errors and receiving decisions results).

the circuits comprise portions for interposing analysis and a corrective action between the response-generating subsystem and the command receiving subsystem (page 1498 describes the Version layer reporting errors and receiving decisions results and those result come from the decision and executive layer; Best further describes interposing circuitry for detection and correction at column 5, lines 43-51).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496,

column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

73. Best does not disclose, while Avižienis teaches:

said circuits receive from such system error messages warning of incipient failure, and issue recovery commands to such system (page 1498 discloses specific application and OS error recovery commands handled by the Local executive, while Best discloses substituting the correct data onto the channel).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single

computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

65. Best discloses:

circuits of the network for operating programs to guard such system such failure (column 5, lines 23-27);

the circuits comprising portions for interposing analysis and corrective action between the response-generating subsystem and the command-receiving subsystem (column 5, lines 43-51),.

Avižienis discloses:

Apparatus for deterring failure of a computing system that is substantially exclusively made of commercial, off the shelf components and that has at least one subsystem for generating a response of the system to failure, and that also has at least one subsystem receiving recovery commands (page 1498 describes the Version layer reporting errors and receiving decisions results), ; said apparatus comprising:

a network of components having terminals for connection to such system between the response-generating subsystem and the recovery-command-receiving subsystem (Figure 2).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear

intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

66. Best discloses:

such computing system (column 5, lines 23-27).

67. Best discloses:

the circuits cannot and do not run any application programs (column 6, lines 28-45: no application programs are disclosed and the logic elements are simple comparators and voters which the capability to carry out application execution).

68. Best discloses:

by responding to an error signal from such system 9column 4, lines 60-64) the circuits protect the entire such system (column 3, lines 21-28) from failure..

69. Best does not disclose, while Avižienis teaches:

the network is an interface which is generic in that it can accommodate any such system that can issue an error message and handle recovery command (page 1498: DEDIX hides all the fault processing from the version layer, and it is the decision and executive layer which performs this functionality, making it generic).

81. Avižienis discloses:

An infrastructure for a computing system that has at least one computing node (the server running the Version layer) for running at least one application program (the N Version); said infrastructure being for guarding the system against failure (column 2, lines 56-69) comprising:

at least one monitoring node (M-node) for monitoring the condition of the at least one C-node by waiting for an error signal, indicating incipient such failure, from the at least one C-node and responding to the error signal by sending a recovery command to the at least one C-node (the Decision and Executive Layer is interpreted as the M-Node and performs these function as listed on page 1498); and

at least one adapter node (a-node) for transmitting the error signal and recovery command between the at least one C-node and at least M-node (1497, figure 2, box labeled sender performs this function) .

Avižienis does not explicitly disclose, Best teaches:

the at least one M-Node is manufactured to be and remains wholly distinct from the at least one C-node (Figure 3, column 3, lines 21-29).

the at least M-Node cannot, and does not, run any application program (Figure 3, column 6, lines 28-48 disclose only safe guard functionally being programmed).

Best as shown above discloses a hardware based system to monitor plural processing/computing channels for errors in a separate computing system (column 3, lines 15-29; column 4, lines 14-25). Best further discloses that his system is application to all types of digital systems (column 6, lines 29-61) and further are further applicable at any level (column 6, lines 42-47). Avižienis teaches the use of the DEDIX distributed data processing system, and more importantly that is may implemented in single computer and multiple computer acting in concert across a network (page 1497, column 2). Avižienis further describes the fault handling system as being separated into separate distinct layers (page 1497, column 2). Avižienis further describes the needs as an architectural need: hardware voting and consistency checking (page 1496, column 1). From these passages one of ordinary skill concludes that Avižienis has expressed a need for a hardware support structure to manage the voting he describes, and that it can be implemented in multiple distribution styles. Best provides a clear intend to be used in hardened voting schemes with processors which may go astray and must be corrected timely (specifically avionics, which as a side note Avižienis produces later papers on the need for such system in space craft, as specialization of avionics). Therefor it would have been obvious to one of ordinary skill in the art at the time of invention to implement the fault tolerant portions of the layered DEDIX system of

Avižienis with the hardware fault locating and handling system of Best, thereby creating a stronger N-Version software system.

82. Best discloses:

such computing system (column 5, lines 23-27).

83. Avižienis discloses:

a decision making node (D-node) for comparing output data generated by such plural C-nodes and reporting to the at least one M-Node any discrepancy between the output data (generic decision algorithm of page 1498); and wherein:

the at least one M-node analyzes the D-node reporting, and based thereon then arbitrates among the C-nodes (the local and global executives determine solution and carry them out).

(10) Response to Argument

General Form and Procedural Issues

I. Form of the Arguments

Applicant has deliberately not formatted the arguments in the manner recommended by the Office, preferred by the Board of Appeals, and strongly recommended for Examiners. The Examiner is therefore modifying the typical format of the Examiner's Response to Arguments to adapt to this change. The Board is urged to review the actual rejections themselves and not lose sight of the Examiner's rationalefor the rejections.

II. Reliance on Affidavits

Applicant routinely defers to the Affidavit of Laprie. Under current MPEP guidance this is not permissible. MPEP specifically states that while it must be

reviewed and considered for what it contains, the legal finds themselves are not to be considered. In this case, Laprie is not an expert in United States patent law, and therefore most certainly not qualified to make determination on novelty, obviousness standards or 35 USC §112. The Affidavit was reviewed and taken under consideration as required under MPEP716.01 C III.

III. Pre-emption

During the Appeal process of the instant application, the Office and Technical Center 2100 has begun to take aggressive action to thwart pre-emption under 35 USC §101. No rejection has been made in the instant application under 35 USC §101; however, Applicant has drafted claims and raised arguments in the Appeal directed towards generic and non-limiting uses. The Board may wish to consider this aspect, as the Examining Corps is not at this time able to fully handle this advanced issue of law.

IV. Interview Contents

Applicant repeatedly makes reference to conversations, and in fact created negative limitations based upon them. Applicant continues to argue conversations for which there are not detailed transcripts. The Board is reminded, the Office is only to consider arguement made in writing when determining patentability of an application. Conversations are often ambiguous and may easily be taken out of context. Further, under current Office policy, it is the Primary Examiner who prosecutes an application. Applicant has repeatedly attempted to involve the Technical Center Director and

Supervisory Patent Examiner in the prosecution of the application. Applicant is aware that to access those individuals petitions must be filed. Their action or input is irrelevant no matter how enlightening, as this an Appeal on Appealable matter, and not a petition to the TC Director.

General Claim Arguments

I. Exclusively Hardware

Applicant has claimed:

a hardware network of components, having substantially no software and substantially no firmware except programs held in an unalterable read-only memory (Best: Figures 3, 4 and 5 disclose a hardware network of fault detection and handling components).

Applicant has deliberately qualified and left open the claim language through use of "substantially." "Substantially" as described in the MPEP is to be permitted to bridge the gap between the physical reality and legal precision. Nothing is truly planar, linear, circular, or any other physical absolute. However, logic devices can easily be constructed with out software or firmware. Software or firmware does not simply grow in a system. It is only there because someone knowingly or unknowingly placed it in the system. Because of this and the strange claim structure Applicant has chosen, the Examiner contends software and firmware must fall within the scope of the claims. Applicant repeatedly argues these claims are meant to be broad and prevent infringement. Applicant has made clear, that should a third party add firmware or

software in order to circumvent a hardware only claim, the third party would be infringing. If the third party is infringing, then the product with software or firmware must be covered by the claims.

II. Generic Computer

Best at column 6, lines 28-61 describes the computer as not being limited to any specific structure. Best does disclose the system is best used for redundant flight control systems. The Examiner points out, the present invention was actually developed for redundant flight control systems.

III. Entire Computer

Applicant argues Best does not protect the entire system from faulty components. Best clearly protects the entire computer system. Best is directed towards a flight control system. Should the flight control system of an aircraft fail, the computer system, not simply the flight control system, fuselage, crew and many other things are placed in great jeopardy as the air will most likely crash. As such the Examiner feels justified is asserting Best protects the entire system from failure. once again the Board encouraged to read Applicant's speciation and notice Applicant's invention grew out of space flight control technology.

IV. Use of "Substantially Exclusively"

Applicant has continually used the phase "substantially exclusively." As intimated above by the discussion of the role of firmware in Best and the instant application, this terminology is particularly troublesome with regard to 35 USC §112, second paragraph. Applicant has explicitly stated the desire to claim as broadly and predict infringement. Applicant's zealous activity has placed the claims in such a state the Examiner is unable to determine the metes and bounds of the claims. The Examiner understands Applicant's desire to protect the inventor, however the Examiner is unable to resolve the metes and bounds of the claims. Prior art can not applied as the Examiner is unsure what the claims mean at any given instant. Applicant has tried file wrapper estoppels and copious arguments to dissuade these rejections. The Examiner has no recourse but to allow the Board to determine the scope of the claims. The Examine is unsure if the Applicant is even entitled to claim the origin of claims elements which Applicant readily admits Applicant did not invent. Ultimately the question rests with: Is an experienced Primary Examiner able to determine whether or not he is befuddled by a claim?

Applicant believes the claim is perfect and allowable on the face. The Examiner contends the claims under 35 USC §112 rejections for this type of terminology can not be legally resolved and thus can not be effectively examined or passed Issue.

V. Use of "such" and 35 USC §112, Fourth Paragraph

The Examiner readily admits the rejection of claim under 35 USC §112, fourth paragraph is highly irregular, generally being relegated to an objection and thus a

petitionable issue. In April 2004, a standard duplicate claim objection was made as the subject matter was so close as to be indistinguishable from the parent. Applicant, rather than remove the claim, added additional instances of this type of claim to the Application. As Applicant clearly had no intention of following the direction of the Examiner and not petitioning the objection, the objection was escalated to a rejection. Applicant argues about a shift of focus and intent for litigation and coverage purposes. The Examiner maintains no limitations were added or removed, and each and every element of the parent claims must be found to reject the dependent claim. As such there is no change in scope. If Applicant truly wished to change the invention, a new independent claim, setting forth the network or computer as what was invented should have been added.

Applicant cites numerous examples of "such" in the claims. This is only evidence of "such" having a valid meaning is some cases in some claims, at another Examiner's discretion. The Examiner has never argued that "such" is not a word, simply that a claim only reciting "such element" does not further limit the base claim.

Applicant cites a portion of statute used for reissue. Once again the Examiner never believed the use of such was prohibited in patent law. The Examiner simply maintains these claims fail to further limit the claims upon which they are based.

VI. Presence of hosts in Best

Applicant argues at page 25 that Best uses hosts which violate the claim language. The Board is first invited to review the detailed rejection. Applicant cites the portion of Best, below:

"[T]he global buses are dynamically grouped under software control to form redundant communication channels. Messages over these channels represent the computational results of the redundant computers interconnected by the network."

First, Applicant overlooks that the redundant computers form the hosts of applicant's claims which Best describes as "clusters of computing elements." Host is a very loose term in the computing arts. While software may be in control of something in Best, Applicant has not proven it is the prohibited host of the claim limitations. Applicant then further points out this is inherent. A Patent Examiner must provide proof of the only way of performing an operation when inherency is used. The Applicant has provided no such proof.

VII. Failure to Provide Proper Motivation

Applicant argues the Examiner has failed to provide proper motivation. The Examiner maintains the Graham v Deere structure has been followed and particularly in view of KSR INTERNATIONAL CO. v. TELEFLEX INC as hear by the United States Supreme Court, the motivation given above is sufficient.

Additionally, The Examiner once again points out Laprie can not be relied upon in and of itself for establishing non-obviousness.

VIII. Negative Limitations

Applicant has specifically disclaimed a possible implementation of the previously pending claim. Namely at one time during prosecution claim 1 encompassed a standard circuit breaker. Nowhere in the speciation is this discussed, and was the result of a telephone interview. The Examiner contends that the addition of this limitation is unsupported in the specification and thus a rejection under 35 USC §112, first paragraph is required. Applicant argues that circuit breakers where never contemplated as being covered by the breadth of the claims at that time, and thus Applicant may freely amend the claims and specification to reflect this fact.

The Examiner points out Applicant, throughout the background and every response to an Office Action, has repeatedly indicated litigation as the a very real possibility if not purpose of this application. Applicant has maintained through out the prosecution the aggressive protection of breadth. As such the Examiner can only view anything and everything as potentially within the scope of the claims unless a specific reason can be found in the specification.

VIII. Rejections in Detail per Claim

Provided above in the Rejections of the Claims, are detailed explanations of claim rejections on a per claim basis with detailed logic behind each rejection. These

are a cleaned version of the rejections found in the Final Official Action of August 24th, 2006. Most changes made to the rejections either reestablish proper claim identification, correct grammar remove portions of rejections no longer pending.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Bryce P. Bonzo

Bryce Patrick Bonzo

Conferees:

Robert Beausoliel

Thomas Lee